of HABERLANDT'S "arm palisade parenchyma," differing from it in the several arms or branches being borne upon a larger basal cell. This peculiar modification is called by the author "coralloid palisade parenchyma," and is known only in Meliosma. The pneumatic tissue is often very open and passes insensibly into the palisade tissue; and it appears as if the chlorenchmya might be composed merely of pneumatic tissue modified somewhat on the upper face of the leaf-blade. Calcium oxalate occurs in all the species of Meliosma, and mostly as druids; globose conglomerations, however, were also observed in some few species.—THEO. HOLM.

Origin of the yeasts.—The problem of the autonomy of the group of Saccharomyces has been reopened by the researches of VIALA and PACOTTET.[8] In two ascomycetes, *Gloeosporium ampelophagum*, the anthracnose of the grape, and *G. nervisequum*, the anthracnose of the plane-tree, they have found a complex polymorphism, the most striking feature of which is the presence of conidia capable of budding in yeast-like fashion and of forming endospores in cysts, like yeasts, but which are produced from the true ascomycete mycelium. Other fungi, such as the Mucorineae, Ustilagineae, etc., bud in this fashion also, but the formation of endospores was regarded by HANSEN as a certain characteristic of true yeasts. If these observations of VIALA and PACOTTET are correct, they would seem to indicate that what are known as yeasts may only be forms of polymorphic ascomycetes.

GUILLIERMOND,[9] in reviewing this work, grants that there may be such forms, but strongly suspects that the cultures were impure and contained not only the Gloeosporium but also a yeast living with it. The most experienced observers have been led into errors from this same cause. In defense of the autonomy of the Saccharomycetes and at the same time of the interpretation of the cyst producing endospores as an ascus, GUILLIERMOND[10] gives a general review of the yeast situation. The extended work of HANSEN and his students has made it highly improbable that our industrial yeasts could ever revert to the mycelial condition, that is, their characters have become so fixed that now they form an independent and distinct group of the ascomycetes. The conjugations in such yeasts as *Zygosaccharomyces Barkeri* and *Schizosaccharomyces octosporus*, as they have been observed by BARKER[11] and GUILLIERMOND, is the strongest reason for considering the resulting product as an ascus. This conjugation, with its fusion of nuclei and subsequent division into endospores, is regarded by GUILLIERMOND as the equivalent of the fusion of the two nuclei in the ascus and the formation of ascospores. It is true that a majority of the yeasts do not show this conjugation, but

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[8] VIALA et PACOTTET, Compt. Rend. Acad. Sci. Paris **142**:458–461. 1906.

[9] GUILLIERMOND, A., A propos de l'origine des levures. Ann. Mycol. **5**:49–69. 1907.

[10] GUILLIERMOND, A., Rev. Gén. Bot. **17**:337–376 *pls 6–9* 1905.

[11] BARKER, Phil. Trans. Roy. Soc. London B. **194**:467–485. *pl. 46.* 1901.

this may be due to the fact that they have become parthenogenetic. The conjugation observed in *Saccharomycodes Ludwigii* by GUILLIERMOND, where the endospores conjugate before germination, may be only a secondary development introduced into parthenogenetic forms as a means of recuperation. "The existence of the conjugation preceding sporulation, coupled with the cytological character of the sporange, demonstrate in an evident manner the ascogenous nature of this organ, and one ought to consider with HANSEN that the Saccharomyces constitute an autonomous group belonging to the Ascomycetes and near to the Exoascaceae."—B. F. LUTMAN.

Heredity in micro-organisms.—Working with the yeast *Saccharomyces anomalus* and the bacteria *B. coli-communis*, *B. typhosus*, and *B. megatherium*, BARBER[12] has extended the investigations of HANSON, BEIJERINCK, CONN, MAYER, and others on such variation as may arise spontaneously from cells which vary independently of environment. The cells chosen were those showing a morphological difference from the parent, and the new races of descendants were tested further for biochemical differences. The problem of isolation was thus a much more difficult one than that of selection of bacterial "sports" in mass with physiological differences, such as that of a white colony among red pigmented ones. BARBER devised and describes an ingenious method for isolating single varying cells from a hanging drop under the microscope by means of a capillary tube, with apparatus for holding and adjusting it under the lens. A single cell drawn into this could be discharged into another hanging drop, placed in a sealed moist chamber, and its development and descendants watched for as many generations as necessary. With the yeast BARBER obtained in this way new races whose morphological characters (large, long cells) persisted over three years, such a new race successfully competing with the parent stock when mixed with it in culture. Attempts to further modify the race by selection failed. Much the same results were obtained with the bacteria. These varieties were true mutations, appearing suddenly with full-fledged characters, apparently independent of natural selection and comparable with sports among multicellular organisms. If physiological characters are correlated with morphological, as in the case of increased power of fermentation of one of BARBER'S races of *B. coli*, it seems probable that mutation may be a factor in the origin of increased virulence of some pathogenic bacteria.—MARY HEFFERAN.

Position of the nucleus.—KÜSTER[13] has made a rather extensive series of observations upon the relation between the position of the nucleus and cell growth and the formation of membranes. His conclusions differ from those of HABERLANDT, especially in reference to the position of the nucleus in root hairs and stomatal apparatus, and in cells undergoing local thickenings of the cell wall.

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[12] BARBER, MARSHALL A., On heredity in certain micro-organisms. Kansas Univ. Sci. Bull. **4**:3–48. *pls. 1–4.* 1907.

[13] KÜSTER, ERNST, Ueber die Beziehungen der Lage der Zellkernes zu Zellenwachstum und Membranbildung. Flora **97**:1–23. 1907.